PB-240 304

CANANDAIGUA LAKE, ONTARIO AND YATES COUNTIES, NEW YORK

Pacific Northwest Environmental
Research Laboratory

Prepared for:

National Environmental Research Center
New York State Department of Environmental Conservation
New York National Guard

November 1974

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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Report

on

Canandaigua Lake

Ontario and Yates Counties

New York

EPA Region II

Working Paper No. 149

With the cooperation of the

New York State Department of Environmental Conservation

and the

New York National Guard

November, 1974

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FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the New York Department of Environmental Conservation for professional involvement and to the New York National Guard for conducting the tributary sampling phase of the Survey.

Henry L. Diamond, Commissioner of the New York Department of Environmental Conservation, and Leo J. Hetling, Director, and Italo G. Carcich, Senior Sanitary Engineer, Environmental Quality Research, Department of Environmental Conservation, provided invaluable lake documentation and counsel during the Survey.

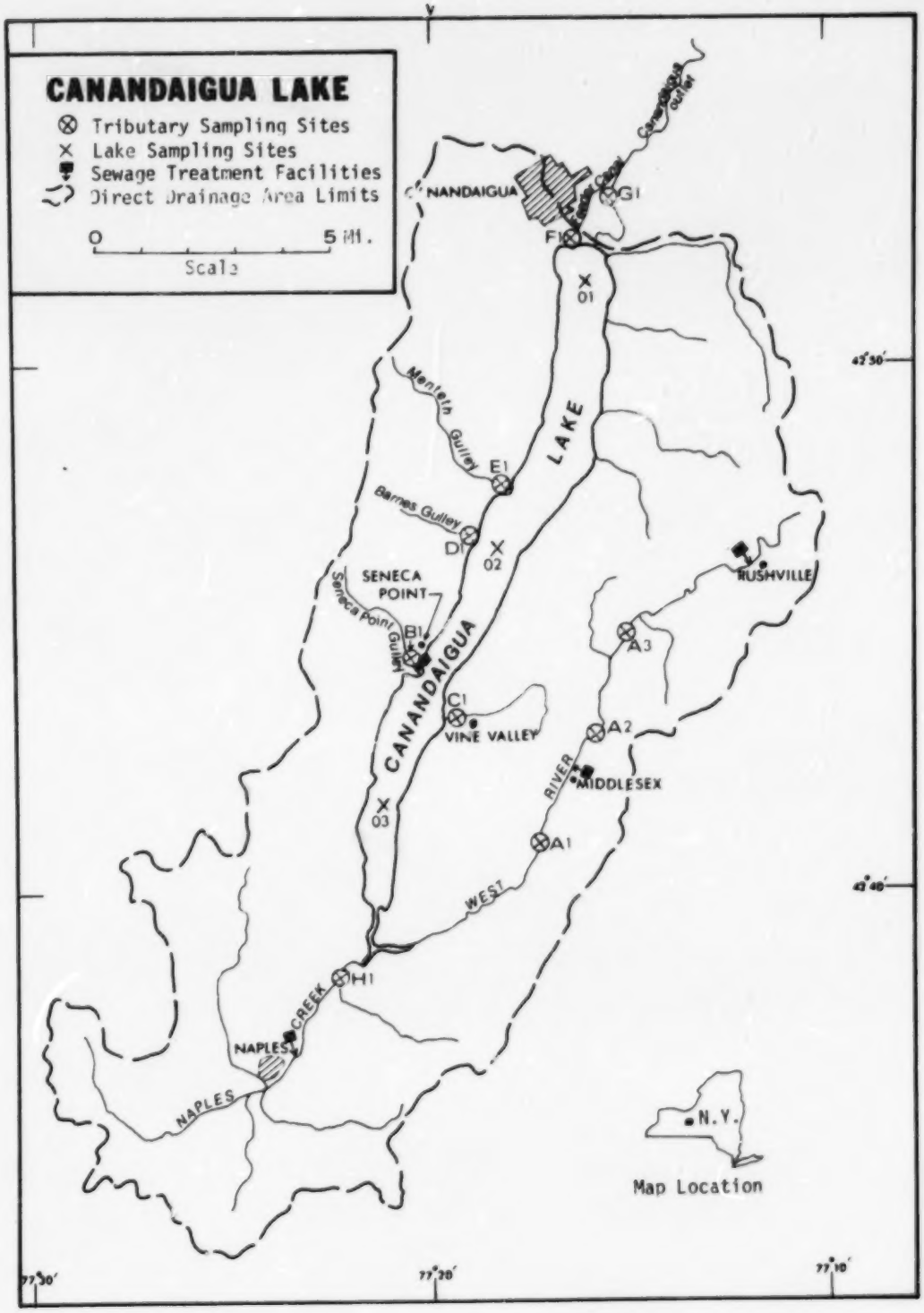
Major General John C. Baker, the Adjutant General of New York, and Project Officer Lieutenant Colonel Fred Peters, who directed the volunteer efforts of the New York National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF NEW YORK

LAKE NAME	COUNTY
Allegheny Reservoir	Cattaraugas, NY; McLean, Warren, PA
Black	St. Lawrence
Canandaigua	Ontario
Cannonsville	Delaware
Carry Falls	St. Lawrence
Cassadaga	Chautauqua
Cayuga	Seneca, Tompkins
Champlain	Clinton, Essex, NY; Addison, Chittenden, Franklin, VT
Chautauqua	Chautauqua
Conesus	Livingston
Cross	Cayuga, Onondaga
Goodyear	Otsego
Huntington	Sullivan
Keuka	Ontario
Long	Hamilton
Lower St. Regis	Franklin
Otter	Cayuga
Owasco	Cayuga
Raquette Pond	Franklin
Round	Saratoga
Sacandaga Res.	Fulton, Saratoga
Saratoga	Saratoga
Schroon	Essex, Warren
Seneca	Seneca, Schyler, Yates
Swan	Sullivan
Swinging Bridge Res.	Sullivan


CANANDAIGUA LAKE
Tributary Sampling Sites
Lake Sampling Sites
Sewage Treatment Facilities
Direct Drainage Area Limits
0
5 MI.
Scale
CANANDAIGUA
G1
F1
01
Menteth Gulley
E1
LAKE
Barnes Gulley
D1
02
SENECA POINT
Seneca Point Gulley
B1
CANANDAIGUA
C1
VINE VALLEY
RUSHVILLE
A3
A2
RIVER
MIDDLESEX
03
A1
WEST
H1
CREEK
NAPLES
NAPLES
N.Y.
Map Location
43°30'
43°20'
77°30'
77°20'
77°10'

CANANDAIGUA LAKE

STORET NO. 3604

I. CONCLUSIONS

A. Trophic Condition:

Survey data and data of other studies indicate Canandaigua Lake is oligotrophic. Of the 26 New York lakes sampled in the fall when essentially all were well-mixed, only one (Schroon Lake) had less mean total phosphorus, four had less mean dissolved phosphorus, but 16 had less mean inorganic nitrogen. For all sampling data, four lakes had less mean chlorophyll a, but none had a greater Secchi disc transparency. Only a slight depression of dissolved oxygen with depth (to 218 feet) was noted.

Birge and Juday (1914), in their classical study of the Finger Lakes, reported a Secchi disc transparency of 3.7 meters for the month of August. Survey data for the month of July indicate a mean Secchi disc transparency of 3.0 meters for all stations, thus there is some indication of change in transparency.

B. Rate-Limiting Nutrient:

The algal assay results indicate Canandaigua Lake was phosphorus limited at the time the sample was collected (October, 1972).

The lake data also indicate phosphorus limitation at all sampling times; i.e., nitrogen to phosphorus ratios were greater than 14 to 1, and phosphorus limitation would be expected.

C. Nutrient Controllability:

1. Point sources--During the sampling year, Canandaigua Lake received a total phosphorus load at a rate a little less than that proposed by Vollenweider (in press) as "permissible"; i.e., an oligotrophic rate (see page 13). Of that load, it is estimated that point sources (including shoreline septic tanks) contributed about 46%. The state-wide ban of phosphates in detergents may be expected to reduce phosphorus loading from wastewater treatment plants about 50% (after existing supplies of phosphate detergent are exhausted). The ban on phosphate detergents, together with the existing favorable loading rate, should preserve the oligotrophic condition of Canandaigua Lake.

2. Non-point sources (see page 13)--The non-point phosphorus exports of the Canandaigua Lake tributaries compare very favorably to the exports of unimpacted streams studied elsewhere in New York (e.g., Keuka Lake*). However, the phosphorus export of the unnamed stream (C-1) was appreciably greater than the other streams and may have resulted from septic tanks at the community of Vine Valley (see map, page vi).

In all, it is estimated that non-point sources contributed about 54% of the total phosphorus load to the lake during the sampling year.

* Working Paper No. 160.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry†:

1. Surface area: 10,624 acres.
2. Mean depth: 128 feet.
3. Maximum depth: 274 feet.
4. Volume: 1,359,872 acre/feet.
5. Mean hydraulic retention time: 15 years.

B. Tributary and Outlet:
(See Appendix A for flow data)

1. Tributaries -

Name	Drainage area*	Mean flow*
West River	29.3 mi^2	17.1 cfs
Seneca Point Gulley	4.4 mi^2	2.6 cfs
Unnamed Stream (C-1)	4.7 mi^2	2.7 cfs
Barnes Gulley	1.3 mi^2	0.7 cfs
Menteth Gulley	6.0 mi^2	3.6 cfs
Naples Creek	47.7 mi^2	49.1 cfs
Minor tributaries & immediate drainage -	74.0 mi^2	52.3 cfs
Totals	167.4 mi^2	128.1 cfs

2. Outlet -

Feeder Canal & Canandaigua outlet	184.0 mi^2**	128.1 cfs**

C. Precipitation***:

1. Year of sampling: 29.2 inches.
2. Mean annual: 22.8 inches.

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† Gelser, 1974.
* Drainage areas are accurate within ±5%, except for small basins (±10%); mean daily flows are accurate within ±5 to 25%; and normalized mean monthly flows are accurate within ±15%.
** Includes area of lake; outflow adjusted to equal sum of inflows.
*** See Working Paper No. 1, "Survey Methods".

III. LAKE WATER QUALITY SUMMARY

Canandaigua Lake was sampled three times during the open-water season of 1972 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from three stations on the lake and from a number of depths at each station (see map, page v). During each visit a single depth-integrated (15 feet or near bottom to surface) sample was composited from the three stations for phytoplankton identification and enumeration; and during the last visit, a single five-gallon depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 15 feet at station 1, 218 feet at station 2, and 156 feet at station 3.

The results obtained are presented in full in Appendix B, and the data for the fall sampling period, when the lake was essentially well-mixed, are summarized below. Note, however, the Secchi disc summary is based on all values.

For differences in the various parameters at the other sampling times, refer to Appendix B.

A. Physical and chemical characteristics:

Parameter	Minimum	Mean	Median	Maximum
		FALL VALUES (10/14/72)		
Temperature (Cent.)	4.5	9.8	12.5	13.8
Dissolved oxygen (mg/l)	8.0	9.4	9.6	10.6
Conductivity (μmhos)	304	319	320	340
pH (units)	7.6	8.0	8.1	8.2
Alkalinity (mg/l)	83	107	108	120
Total P (mg/l)	0.005	0.008	0.007	0.029
Dissolved P (mg/l)	0.004	0.005	0.005	0.007
$NO_2 + NO_3$ (mg/l)	0.260	0.360	0.320	0.480
Ammonia (mg/l)	0.030	0.032	0.030	0.040
		ALL VALUES		
Secchi disc (inches)	110	177	168	252

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Number per ml
05/27/72	1. Chroococcus	1,663
	2. Fragilaria	499
	3. Dinobryon	289
	4. Synedra	181
	5. Anabaena	51
	Other genera	151
	Total	2,834
07/21/72	1. Synedra	844
	2. Dinobryon	542
	3. Fragilaria	286
	4. Navicula	75
	5. Cyclotella	45
	Other genera	160
	Total	1,952
10/14/72	1. Scenedesmus	1,457
	2. Dinobryon	1,080
	3. Flagellates	729
	4. Pediastrum	477
	5. Melosira	226
	Other genera	1,182
	Total	5,151

2. Chlorophyll a -
(Because of instrumentation problems during the 1972 sampling, the following values may be in error by plus or minus 20 percent.)

Sampling Date	Station Number	Chlorophyll a (µg/l)
05/27/73	01	2.6
	02	4.1
	03	3.5
07/21/72	01	9.0
	02	5.6
	03	7.4
10/14/72	01	1.9
	02	2.3
	03	2.6

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.001	0.192	0.1
0.010 P	0.011	0.192	2.0
0.020 P	0.021	0.192	6.3
0.050 P	0.051	0.192	8.6
0.050 P + 5.0 N	0.051	5.192	14.2
0.050 P + 10.0 N	0.051	10.192	14.9
10.0 N	0.001	10.192	0.1

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that Canandaigua Lake had a relatively low potential for primary production at the time of sampling. The assay also indicates Canandaigua Lake was phosphorus limited at the time of sampling. Note that the addition of phosphorus alone or in combination with nitrogen produced

a yield significantly greater than the control yield, while the addition of only nitrogen did not. The lake data also indicate phsophorus limitation for Canandaigua Lake at all sampling times (N/P ratios were greater than 14/1, and phosphorus limitation would be expected).

IV. NUTRIENT LOADINGS
(See Appendix C for data)

For the determination of nutrient loadings, the New York National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of April and May when two samples were collected. Sampling was begun in November, 1972, and was completed in October, 1973.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the New York District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loadings for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated by using the means of the nutrient loads, in $lbs/mi^2/year$, at stations C-1, D-1, and E-1 and multiplying the means by the ZZ drainage area in mi^2. Loadings for Naples Creek were calculated in the same manner. The nutrient loads attributed to the other tributaries are those measured or estimated minus point-source loads, if any.

Bristol Harbor Village, Middlesex, Naples, and Rushville did not participate in the Survey, and nutrient loads for these sources were estimated*.

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* See Working Paper No. 1.

A. Waste Sources:

1. Known municipal -

Name	Pop. Served*	Treatment	Mean Flow (mgd)	Receiving Water
Middlesex Valley Central School	640	septic tanks & sand filters	?	West River
Rushville Village	568	storm sewers & private systems	?	West River
Naples	1,240	primary	?	Naples Creek
Bristol Harbor Village	250	secondary	?	Seneca Point Gulley

2. Known industrial - None

* Carcich, 1974.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	lbs P/ yr	% of total
a. Tributaries (non-point load) -		
West River	1,050	7.9
Seneca Point Gulley	70	0.5
Unnamed Stream (C-1)	320	2.4
Barnes Gulley	20	0.2
Menteth Gulley	60	0.4
Naples Creek	1,570	11.8
b. Minor tributaries & immediate drainage (non-point load) -	2,440	18.3
c. Known municipal STP's -		
Bristol Harbor Village	630	4.7
Middlesex	1,600	12.0
Naples	3,100	23.3
Rushville	140	1.0
d. Septic tanks* -	660	5.0
e. Known industrial - None	-	-
f. Direct precipitation** -	1,660	12.5
Total	13,320	100.0

2. Outputs -

Feeder Canal & outlet 4,630

3. Net annual P accumulation - 8,690 pounds

* Based on 1,052 lakeshore residences; see Working Paper No. 1.
** See Working Paper No. 1.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	lbs N/ yr	% of total
a. Tributaries (non-point load) -		
West River	51,660	14.8
Seneca Point Gulley	4,140	1.2
Unnamed Stream (C-1)	7,170	2.1
Barnes Gulley	1,180	0.3
Menteth Gulley	6,100	1.7
Naples Creek	57,380	16.4
b. Minor tributaries & immediate drainage (non-point load) -	89,020	25.4
c. Known municipal STP's -		
Bristol Harbor Village	1,880	0.5
Middlesex	4,800	1.4
Naples	9,300	2.7
Rushville	5,340	1.5
d. Septic tanks* -	9,890	2.8
e. Known industrial - None	-	-
f. Direct precipitation** -	102,350	29.2
Total	350,210	100.0

2. Outputs -

Lake outlet - Feeder Canal & outlet	174,560

3. Net annual N accumulation - 175,650 pounds

* Based on 1,052 lakeshore residences; see Working Paper No. 1.
** See Working Paper No. 1.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	lbs P/mi^2/yr	lbs N/mi^2/yr
West River	36	1,763
Seneca Point Gulley	16	941
Unnamed Stream (C-1)	68	1,523
Barnes Gulley	15	908
Menteth Gulley	10	1,017

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (in press). Essentially, his "dangerous" rate is the rate at which the receiving waters would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

	Total Phosphorus		Total Nitrogen	
Units	Total	Accumulated	Total	Accumulated
lbs/acre/yr	1.3	0.8	33.0	16.5
grams/m^2/yr	0.14	0.09	3.7	1.9

Vollenweider loading rates for phosphorus (g/m^2/yr) based on mean depth and mean hydraulic retention time of Canandaigua Lake:

"Dangerous" (eutrophic rate)	0.32
"Permissible" (oligotrophic rate)	0.16

V. LITERATURE REVIEWED

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VII. APPENDICES

APPENDIX A

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR NEW YORK 11/26/74

LAKE CODE 3604 CANANDAIGUA LAKE

TOTAL DRAINAGE AREA OF LAKE 194.00

NORMALIZED FLOWS

TRIBUTARY	SUB-DRAINAGE AREA	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
3604A1	29.30	11.00	21.00	62.00	54.00	26.00	8.50	0.70	0.40	0.30	1.80	5.20	14.00	17.13
3604B1	4.41	1.70	3.20	9.00	7.90	3.90	1.40	0.30	0.20	0.07	0.50	0.80	2.30	2.60
3604C1	4.65	1.80	3.30	9.30	8.20	4.00	1.40	0.30	0.20	0.07	0.50	0.80	2.40	2.68
3604D1	1.28	0.50	0.80	2.40	2.10	1.00	0.40	0.08	0.06	0.02	0.10	0.20	0.60	0.69
3604E1	6.03	2.40	4.40	12.00	11.00	5.40	1.90	0.40	0.30	0.09	0.60	1.10	3.10	3.55
3604F1	184.00	54.00	65.00	140.00	190.00	130.00	69.00	35.00	35.00	35.00	35.00	35.00	45.00	72.28
3604G1	184.00	54.00	65.00	140.00	190.00	130.00	69.00	37.00	10.00	5.00	13.00	20.00	44.00	64.68
3604H1	47.70	33.00	60.00	170.00	150.00	74.00	26.00	5.50	4.20	1.30	8.60	15.00	43.00	49.14
3604ZZ	90.63	35.00	65.00	180.00	160.00	79.00	27.00	5.90	4.50	1.40	9.20	15.00	46.00	52.25

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 184.00
SUM OF SUB-DRAINAGE AREAS = 184.00

TOTAL FLOW IN = 1538.99
TOTAL FLOW OUT = 1645.00

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3604A1	11	72	64.00	5	28.00				
	12	72	94.00	2	50.00				
	1	73	32.00	6	42.00				
	2	73	36.00	4	130.00				
	3	73	80.00	4	220.00				
	4	73	51.00	7	150.00	21	18.00		
	5	73	30.00	5	33.00	19	15.00		
	6	73	26.00	3	15.00				
	7	73	1.40	28	0.60				
	8	73	0.30	17	0.50				
	9	73	0.20	9	0.30				
	10	73	0.30	6	0.20				
3604B1	11	72	2.40	5	4.50				
	12	72	8.00	2	3.80				
	1	73	2.50	6	2.50				
	2	73	5.50	4	18.00				
	3	73	12.00	4	33.00				
	4	73	11.00	7	23.00	21	2.80		
	5	73	4.70	5	5.10	19	2.50		
	6	73	4.30	3	2.40				
	7	73	0.40	28	0.30				
	8	73	0.20	17	0.20				
	9	73	0.20	9	0.20				
	10	73	0.20	6	0.20				

LAKE CODE 3604 CANANDAIGUA LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3604C1	11	72	2.40	5	4.50				
	12	72	8.40	2	3.40				
	1	73	2.70	6	2.70				
	2	73	5.70	4	19.00				
	3	73	12.00	4	34.00				
	4	73	11.00	7	24.00	21	2.90		
	5	73	4.80	5	5.30	19	2.50		
	6	73	4.30	3	2.50				
	7	73	0.40	28	0.30				
	8	73	0.20	17	0.20				
	9	73	0.20	9	0.20				
	10	73	0.20	6	0.20				
3604D1	11	72	0.60	5	1.00				
	12	72	2.10	2	1.00				
	1	73	0.70	6	0.80				
	2	73	1.40	4	4.90				
	3	73	3.20	4	8.50				
	4	73	2.80	7	6.10	21	0.70		
	5	73	1.20	5	1.30	19	0.60		
	6	73	1.70	3	0.70				
	7	73	0.10	28	0.10				
	8	73	0.10	17	0.10				
	9	73	0.10	9	0.10				
	10	73	0.10	6	0.10				
3604E1	11	72	3.30	5	5.80				
	12	72	11.00	2	5.20				
	1	73	4.00	6	3.50				
	2	73	7.60	4	25.00				
	3	73	16.00	4	44.00				
	4	73	15.00	7	31.00	21	3.90		
	5	73	6.50	5	7.10	19	3.90		
	6	73	5.80	3	3.40				
	7	73	0.60	28	0.40				
	8	73	0.30	17	0.40				
	9	73	0.20	9	0.30				
	10	73	0.20	6	0.20				
3604F1	11	72	130.00	5	35.00				
	12	72	250.00	2	210.00				
	1	73	180.00	6	250.00				
	2	73	110.00	4	270.00				
	3	73	180.00	4	200.00				
	4	73	260.00	7	300.00	21	240.00		
	5	73	110.00	5	54.00	19	190.00		
	6	73	110.00	3	150.00				
	7	73	23.00	28	30.00				
	8	73	36.00	17	27.00				
	9	73	35.00	9	35.00				
	10	73	35.00	6	35.00				

TRIBUTARY FLOW INFORMATION FOR NEW YORK 11/26/74

LAKE CODE 3604 CANANDAIGUA LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3604G1	11	72	130.00	5	33.00				
	12	72	250.00	2	210.00				
	1	73	180.00	6	250.00				
	2	73	110.00	4	270.00				
	3	73	140.00	4	200.00				
	4	73	260.00	7	300.00	21	240.00		
	5	73	120.00	5	54.00	19	200.00		
	6	73	110.00	3	160.00				
	7	73	0.0	28	0.0				
	8	73	0.0	17	0.0				
	9	73	12.00	9	28.00				
	10	73	11.00	6	2.00				
3604H1	11	72	45.00	5	81.00				
	12	72	150.00	2	74.00				
	1	73	49.00	6	50.00				
	2	73	100.00	4	350.00				
	3	73	220.00	4	520.00				
	4	73	200.00	7	430.00	21	53.00		
	5	73	89.00	5	97.00	19	47.00		
	6	73	79.00	3	42.00				
	7	73	7.60	28	5.10				
	8	73	3.50	17	5.00				
	9	73	2.80	9	4.00				
	10	73	3.50	6	3.10				
3604Z2	11	72	46.00						
	12	72	170.00						
	1	73	53.00						
	2	73	110.00						
	3	73	240.00						
	4	73	220.00						
	5	73	95.00						
	6	73	83.00						
	7	73	8.10						
	8	73	3.80						
	9	73	3.10						
	10	73	3.70						

APPENDIX B

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 74/11/26

360401
42 51 44.0 077 16 05.0
CANANDAIGUA LAKE
36 NEW YORK

11EPALES
3

2111202
0017 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/05/27	17 00	0000	14.9	12.4	156	280	8.30	115	0.340	0.020	0.005	0.005
	17 00	0011	12.9	13.2		300	8.20	114	0.320	0.010	0.006	0.002
72/07/21	11 20	0000			128	300	8.30	110	0.290	0.070	0.012	0.008
	11 20	0004	26.1	8.1		432	8.00	109	0.270	0.040	0.011	0.007
	11 20	0015	25.8	9.0		429	7.90	109	0.270	0.050	0.012	0.006
72/10/14	10 50	0000			180	320	8.20	111	0.260	0.040	0.007	0.005
	10 50	0004	12.6	9.8		310	8.20	108	0.260	0.040	0.007	0.004
	10 50	0011	12.5	10.0		310	8.20	108	0.260	0.040	0.007	0.004

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/05/27	17 00	0000	2.6J
72/07/21	11 20	0000	9.0J
72/10/14	10 50	0000	1.9J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/11/26

360402
42 47 48.0 077 17 12.0
CANANDAIGUA LAKE
36 NEW YORK

11EPALES 2111202
3 0219 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/05/27	17 30	0000	12.7	12.4	144	300	8.30	115	0.310	0.020	0.008	0.002
	17 30	0010	10.7	12.8		300	8.20	114	0.350	0.050	0.010	0.009
	17 30	0030	8.3	13.4		300	8.20	118	0.360	0.020	0.009	0.005
72/07/21	11 52	0000			110	300	7.80	112	0.310	0.060	0.015	0.010
	11 52	0004	23.3	8.6		384	8.00	111	0.310	0.040	0.017	0.008
	11 52	0015	19.9	8.2		340	7.90	111	0.340	0.070	0.028	0.009
	11 52	0130	4.4	11.0		283	7.30	116	0.420	0.090	0.037	0.010
	11 52	0219	4.6	10.1		298	7.20	116	0.450	0.090	0.037	0.010
72/10/14	11 10	0000			252	320	8.15	104	0.290	0.030	0.007	0.005
	11 10	0004	13.8	9.8		318	8.15	104	0.290	0.030	0.008	0.004
	11 10	0015	13.8	9.6		318	8.15	103	0.290	0.030	0.007	0.004
	11 10	0030	13.8	9.4		320	8.15	105	0.290	0.030	0.006	0.005
	11 10	0050	13.1	9.4		318	8.10	83	0.370	0.030	0.006	0.004
	11 10	0075	10.4	9.4		320	7.90	83	0.390	0.030	0.005	0.004
	11 10	0100	5.7	9.6		325	7.75	115	0.440	0.030	0.005	0.004
	11 10	0140	4.8	9.0		335	7.70	120	0.460	0.030	0.008	0.005
	11 10	0180	4.6	8.8		330	7.65	117	0.470	0.030	0.009	0.006
	11 10	0218	4.5	8.0		340	7.65	117	0.480	0.040	0.029	0.007

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/05/27	17 30	0000	4.1J
72/07/21	11 52	0000	5.6J
72/10/14	11 10	0000	2.3J

J VALUE KNOWN TO BE IN ERROR

STORET RETRIEVAL DATE 74/11/26

360403
42 42 00.0 077 21 02.0
CANANDAIGUA LAKE
36 NEW YORK

11EPALES
3

2111202
0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00630 NO2&NO3 N-TOTAL MG/L	00610 NH3-N TOTAL MG/L	00665 PHOS-TOT MG/L P	00666 PHOS-DIS MG/L P
72/05/27	18 00	0000	10.1	14.9	216	275	8.20	116	0.370	0.040	0.011	0.006
	18 00	0010	5.9	16.5		278	8.10	115	0.380	0.030	0.012	0.008
	18 00	0030	5.1	17.9		275	8.00	114	0.410	0.050	0.012	0.008
72/07/21	12 44	0000				300	8.10	111	0.330	0.060	0.016	0.010
	12 44	0004	22.1	8.6		392	8.00	111	0.320	0.050	0.027	0.013
	12 44	0015	19.9	8.0		366	7.80	111	0.330	0.110	0.096	0.013
	12 44	0080				265						
	12 44	0086	6.1	11.6		310	7.30	114	0.400	0.080	0.015	0.009
	12 44	0125	4.6	9.8		273	7.30	115	0.430	0.080	0.025	0.008
72/10/14	12 00	0000			228	310	8.10	106	0.310	0.030	0.007	0.007
	12 00	0004	13.3	9.8		308	8.10	106	0.310	0.030	0.009	0.005
	12 00	0015	13.3	9.6		308	8.10	109	0.320	0.030	0.007	0.005
	12 00	0030	13.2	9.6		304	8.10	104	0.320	0.030	0.009	0.006
	12 00	0050	13.2	9.6		304	8.05	106	0.320	0.030	0.007	0.005
	12 00	0070	7.6	9.6		320	7.75	107	0.420	0.030	0.006	0.005
	12 00	0090	5.9	8.6		320	7.70	113	0.440	0.030	0.006	0.004
	12 00	0120	4.9	8.6		330	7.60	112	0.470	0.040	0.008	0.005
	12 00	0156	4.7	10.6		330	7.60	109	0.470	0.030	0.009	0.005

DATE FROM TO	TIME OF DAY	DEPTH FEET	32217 CHLRPHYL A UG/L
72/05/27	18 00	0000	3.5J
72/07/21	12 44	0000	7.4J
72/10/14	12 00	0000	2.6J

J VALUE KNOWN TO BE IN ERROR

APPENDIX C

TRIBUTARY DATA

STORET RETRIEVAL DATE 74/11/26

3604A1 LS3604A1
42 41 00.0 077 18 00.0
WEST RIVER
36 7.5 MIDDLESEX
I/CANANDAIGUA LAKE
LGT DUTY RD IN MIDDLE SEX BELO STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/05	14 20		0.870	0.600	0.078	0.046	0.069
72/12/02	13 50		2.250	0.340	0.021	0.021	0.033
73/01/06	14 10		2.000	0.056	0.035	0.020	0.056
73/02/04	12 40		2.500	0.420	0.039	0.023	0.055
73/03/04	08 59		2.600	1.230	0.097	0.032	0.200
73/04/07	11 15		2.400	0.580	0.066	0.054	0.080
73/04/21	10 10		0.200	0.700	0.042	0.046	0.105
73/05/05	12 40		1.020	1.540	0.035	0.044	0.070
73/05/19	09 35		0.320	0.520	0.022	0.066	0.115
73/06/03	13 00		0.520	1.150	0.078	0.105	0.155
73/07/28	14 35		0.010K	1.470	0.036	0.028	0.095
73/08/17	18 25			0.630	0.018	0.027	0.090
73/09/09	09 15		0.010K	1.150	0.063	0.021	0.105
73/10/06	14 00		0.021	0.320	0.020	0.005K	0.055

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3604A2 LS3604A2
42 43 00.0 077 16 00.0
WEST RIVER
36 7.5 MIDDLESEX
I/CANANDAIGUA LAKE
ST HWY 245 BRDG BELO RUSHVILLE STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/05	14 50		0.975	0.550	0.087	0.048	0.060
72/12/02	13 40		2.800	0.340	0.009	0.024	0.033
73/02/04	12 20		3.200	0.240	0.026	0.024	0.055
73/03/04	08 40		3.200	1.540	0.092	0.044	0.260
73/04/07	10 40		3.100	0.750	0.140	0.084	0.120
73/04/21	09 40		0.240	1.000	0.017	0.098	0.220
73/05/05	16 25		1.300	0.660	0.022	0.035	0.063
73/05/19	09 45		0.350	0.500	0.015	0.138	0.185
73/06/03	12 45		0.450	0.615	0.073	0.189	0.230
73/07/28	14 45		0.010K	1.200	0.046	0.069	0.130
73/08/17	18 00			0.980	0.014	0.079	0.168
73/09/09	08 20		0.044	1.050	0.149	0.040	0.125
73/10/06	13 40		0.010K	0.990	0.022	0.019	0.155

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3604A3 LS3604A3
42 45 00.0 077 12 30.0
WEST RIVER
36 7.5 RUSHVILLE
I/CANANDAIGUA LAKE
BLODGETT RD BRDG ABOV RUSHVILLE STP
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/05	13 40		0.940	0.500	0.060	0.012	0.021
72/12/02	13 00		3.600	0.330	0.017	0.008	0.018
73/01/06	13 25		3.650	0.170	0.016	0.007	0.034
73/02/04	11 35		4.100	0.330	0.028	0.013	0.045
73/03/04	07 30		3.400	1.470	0.147	0.056	0.175
73/04/07	10 25		3.800	0.500	0.031	0.018	0.025
73/04/21	09 30		1.660	0.460	0.010	0.006	0.025
73/05/05	16 15		1.980	1.980	0.033	0.005K	0.020
73/05/19	09 00		1.400	0.540	0.016	0.009	0.015
73/06/03	11 30		1.400	0.460	0.011	0.017	0.020
73/07/28	15 10		0.042	0.920	0.036	0.013	0.100
73/08/17	17 00			1.600	0.063	0.019	0.060
73/09/09	08 00		0.010K	1.100	0.044	0.015	0.095
73/10/06			0.010K	1.980	0.030	0.013	

K VALUE KNOWN TO BE
LESS THAN INDICATED

26

STORET RETRIEVAL DATE 74/11/26

3604B1 LS3604B1
42 44 30.0 077 20 30.0
SENECA PT GULLY
36 7.5 MIDDLESEX
T/CANANDAIGUA LAKE
PT RD BRDG NEAR SENECA PT
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/05	15 00		0.061	0.200	0.180	0.007	0.008
72/12/02	14 28		0.650	0.180	0.005K	0.006	0.020
73/01/06	14 40		0.780	0.100K	0.010	0.005K	0.013
73/02/04	13 20		0.700	0.100K	0.005K	0.017	0.030
73/03/04	09 40		0.740	1.200	0.044	0.014	0.190
73/04/07	12 15		0.880	0.160	0.017	0.012	0.020
73/04/21	10 30		0.510	0.160	0.007	0.005K	0.007
73/05/05	17 15		0.315	1.050	0.030	0.005K	0.010
73/05/19	10 25		0.300	0.200	0.008	0.017	0.025
73/06/03	13 50		0.378	0.420	0.017	0.013	0.015
73/07/28	14 10		0.080	0.150	0.020	0.005K	0.010
73/08/17	19 00			0.420	0.022	0.009	0.015
73/09/09	10 20		0.098	0.400	0.031	0.009	0.010

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3604C1 LS3604C1
42 43 30.0 077 19 30.0
UNNAMED STREAM
36 7.5 MIDDLESEX
T/CANANDAIGUA LAKE
EAST LAKE RD BRDG IN VINE VALLEY
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/05	14 00		0.550	0.250	0.037	0.007	0.012
72/12/02	13 25		1.700	0.200	0.006	0.010	0.016
73/01/06	13 45		1.520	0.100K	0.008	0.009	0.015
73/02/04	12 00		2.100	0.200	0.006	0.011	0.025
73/03/04	08 15		2.400	0.830	0.058	0.050	0.145
73/04/07	10 55		0.505	0.240	0.011	0.011	0.030
73/04/21	10 00		0.820	0.250	0.009	0.012	0.025
73/05/05	16 35		0.980	1.900	0.360	0.210	0.270
73/05/19	09 15		0.010K	0.310	0.067	0.056	0.070
73/06/03	12 20		0.760	0.460	0.017	0.037	0.055
73/07/28	14 52		0.147	0.460	0.030	0.074	0.090
73/08/17	17 25			1.150	0.020	0.050	0.060
73/09/09	08 45		0.048	0.780	0.054	0.046	0.050
73/10/06	13 30		0.010K	0.560	0.126	0.027	0.040

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

360401 LS360401
42 47 00.0 077 19 00.0
HAWNES GULLY
36 7.5 CANANDAIG LK
T/CANANDAIGUA LAKE
WEST LAKE RD BRDG NEAR FOSTER POINT
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/05	15 20		0.059	0.150	0.058	0.008	0.010
72/12/02	14 40		0.450	0.330	0.012	0.010	0.012
73/01/06	15 35		0.530	0.250	0.015	0.008	0.011
73/02/04	13 40		0.570	0.170	0.006	0.008	0.020
73/03/04	10 00		0.590	0.540	0.028	0.017	0.120
73/04/07	12 25		1.620	0.185	0.019	0.014	0.020
73/04/21	10 40		0.220	0.130	0.005K	0.007	0.010
73/05/05	17 25		0.135	1.720	0.052	0.008	0.015
73/05/19	10 30		0.011	0.100K	0.006	0.010	0.010
73/06/03	14 20		0.252	0.170	0.005K	0.009	0.010
73/07/28	13 58		0.520	0.420	0.018	0.009	0.015
73/08/17	19 20			0.310	0.015	0.018	0.025
73/09/09	10 40		0.840	0.420	0.025	0.015	0.015
73/10/06	15 00		0.770	0.420	0.054	0.005K	0.015

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3604E1 LS3604E1
42 48 00.0 077 18 00.0
MENTETH GULLY
36 7.5 CANANDAIGUA
T/CANANDAIGUA LAKE
WEST LAKE RD BRDG NEAR MENTETH POINT
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/05	15	55	0.302	0.300	0.110	0.005	0.006
72/12/02	14	45	0.930	0.120	0.005K	0.007	0.009
73/01/06	15	15	1.260	0.190	0.005K	0.007	0.010
73/02/04	13	50	0.840	0.250	0.013	0.006	0.015
73/03/04	10	10	0.870	0.720	0.023	0.013	0.115
73/04/07	13	00	0.900	0.190	0.027	0.011	0.015
73/04/21	10	45	0.800	0.560	0.006	0.005K	0.005K
73/05/05	17	35	0.231	0.440	0.018	0.005K	0.010
73/05/19	10	15	0.110	0.150	0.005K	0.005K	0.005K
73/06/03	14	40	0.410	0.540	0.015	0.007	0.015
73/07/28	13	55	0.390	0.290	0.014	0.005K	0.005K
73/08/17	19	30		0.480	0.036	0.007	0.010
73/09/09	11	00	0.066	0.460	0.033	0.006	0.006
73/10/06	11	40	0.024	0.300	0.031	0.005K	0.005K

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3604F1 LS3604F1
42 52 30.0 077 16 30.0
FEEDER CANAL
36 7.5 CANANDAIGUA
O/CANANDAIGUA LAKE
ST HWY 20 BRDG NEAR KERSHAWPARK
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/05	13 00		0.450	0.500	0.130	0.005K	0.010
72/12/02	14 55		0.390	0.210	0.005K	0.005K	0.007
73/01/06	16 15		0.440	0.210	0.007	0.005K	0.008
73/02/04	14 15		0.550	0.320	0.005K	0.005K	0.020
73/03/04	10 30		0.460	0.250	0.009	0.005K	0.010
73/04/07	13 10		0.520	0.240	0.032	0.006	0.015
73/04/21	13 00		0.370	0.350	0.008	0.005K	0.015
73/05/05	17 45		0.357	0.870	0.028	0.005K	0.015
73/05/19	11 00		0.026	0.300	0.011	0.005K	0.010
73/06/03	15 00		0.273	0.380	0.008	0.007	0.010
73/07/28	13 35		0.069	0.480	0.023	0.005K	0.020
73/08/17	19 59			0.380	0.020	0.005K	0.015
73/09/09	11 30		0.033	0.560	0.065	0.006	0.010
73/10/06	15 20		0.054	0.120	0.062	0.005K	0.010

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

3604G1 LS3604G1
42 53 30.0 077 15 30.0
CANANDAIGUA OUTLET
36 7.5 CANANDAIGUA
O/CANANDAIGUA LAKE
BRDG .75 MI E OF CANANDAIGUA
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	[illegible]10 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/05	13 00		0.160	0.450	0.147	0.005K	0.030
72/12/02	14 59		0.370	0.160	0.011	0.005K	0.007
73/01/06	16 30		0.400	0.210	0.010	0.005K	0.006
73/02/04	14 25		0.440	0.260	0.006	0.005K	0.015
73/03/04	10 40		0.380	0.350	0.013	0.005K	0.015
73/04/07	13 15		0.357	0.260	0.012	0.005K	0.015
73/04/21	11 20		0.370	0.250	0.006	0.005K	0.010
73/05/05	18 00		0.336	1.200	0.028	0.005K	0.015
73/05/19	11 10		0.320	0.290	0.009	0.005K	0.010
73/06/03	15 20		0.270	0.350	0.011	0.007	0.015
73/07/28	13 30		0.010K	0.620	0.025	0.005K	0.060
73/08/17	20 00			1.150	0.058	0.011	0.080
73/09/09	11 45		0.020	0.600	0.030	0.006	0.025
73/10/06	15 40		0.023	0.270	0.150	0.009	0.045

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 74/11/26

360481 LS360481
42 39 00.0 077 22 30.0
NAPLES CREEK
36 7.5 MIDDLESEX
T/CANANDAIGUA LAKE
PARISH FLAT RD 500 FT SE OFNY 21
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
72/11/05	14 00		0.760	0.200	0.110	0.009	0.023
72/12/02	14 07		0.790	0.140	0.007	0.006	0.017
73/01/06	14 20		0.820	0.160	0.016	0.005K	0.019
73/02/04	13 00		0.740	0.240	0.013	0.007	0.045
73/03/04	09 10		0.620	0.670	0.022	0.007	0.140
73/04/07	11 30		0.680	0.180	0.015	0.008	0.030
73/04/21	10 20		0.660	0.150	0.009	0.005K	0.010
73/05/05	17 00		0.490	0.460	0.020	0.005K	0.015
73/05/19	10 00		0.350	0.140	0.005K	0.006	0.010
73/06/03	13 30		0.460	0.480	0.015	0.008	0.010
73/07/28	14 30		0.610	0.290	0.014	0.005K	0.010
73/08/17	18 40			0.690	0.030	0.008	0.050
73/09/09	09 50		0.770	0.710	0.023	0.010	0.015
73/10/06	14 20		0.560	0.100K	0.028	0.005K	0.020

K VALUE KNOWN TO BE
LESS THAN INDICATED